Institute of Freshwater Ecology

Quality audit of biological samples for the 1990 River Quality Survey Highland River Purification Board

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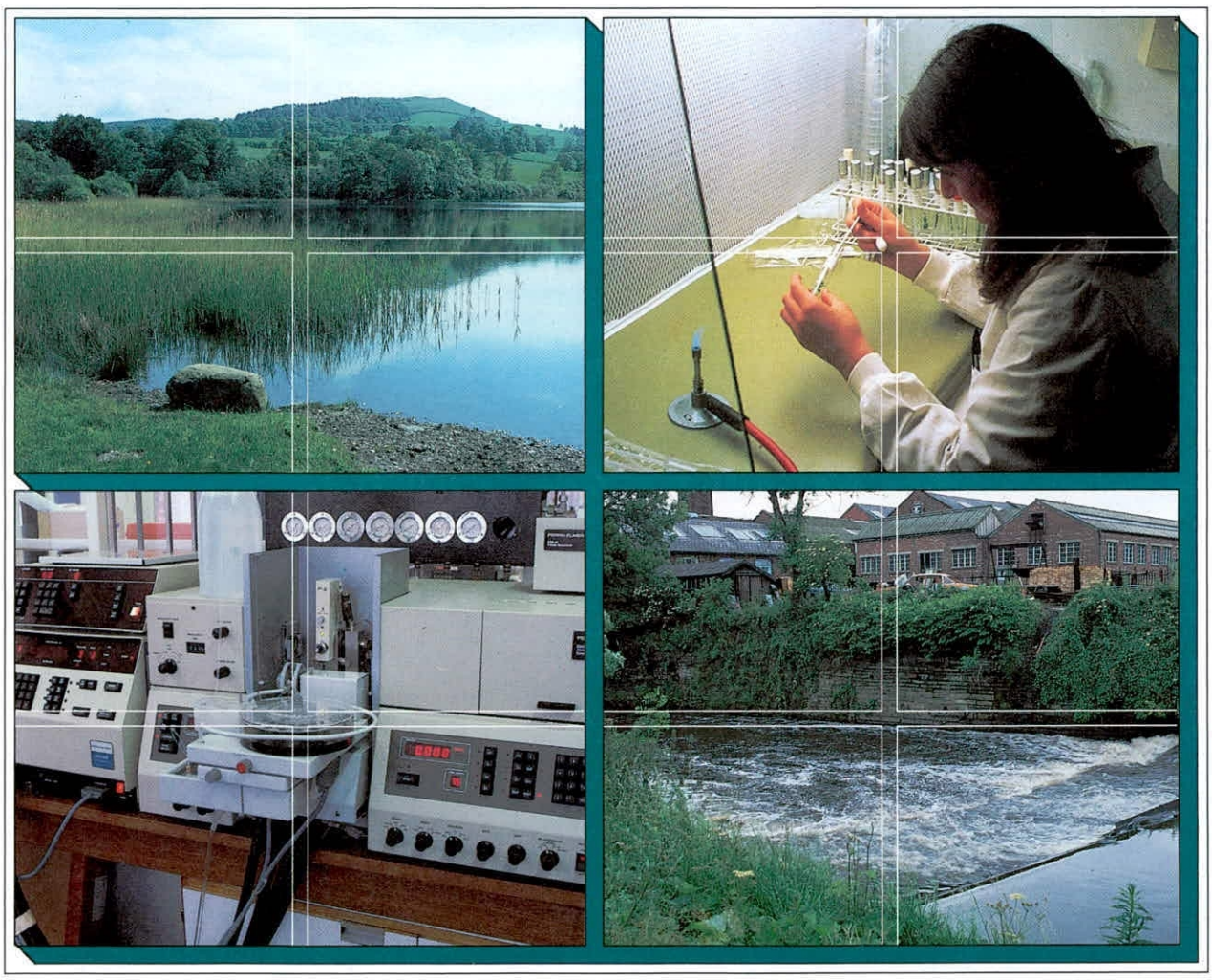

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Quality Audit of Biological Samples for the 1990 River Quality Survey Highland River Purification Board

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The Institute of Freshwater Ecology is part of the Terrestrial and Freshwater Sciences Directorate of the Natural Environment Research Council.

1. INTRODUCTION

The 1990 River Quality Survey included the sampling of aquatic macro-invertebrates for biological assessment of river quality throughout the United Kingdom. In England and Wales the survey was undertaken by the National Rivers Authority (NRA), the River Purification Boards (RPBs) sampled in Scotland and the Department of Economic Development (DED) undertook the work in Northern Ireland.

Approximately 7750 sites were surveyed, the majority of which were sampled in spring, summer and autumn. Standard collection procedures were used and the sampling strategy was compatible with RIVPACS (River InVertebrate Prediction And Classification System), which has been developed by the Institute of Freshwater Ecology (IFE). Most of the remaining sites were sampled in a single season only, in order to extend the scope of the survey. For a variety of reasons, a few locations were sampled in just two seasons.

Samples were sorted for the families of macro-invertebrates included in the Biological Monitoring Working Party (BMWP) system. Taxa present were recorded on site data sheets. Sample processing and recording techniques varied from region to region.

In order to undertake this massive programme of fieldwork and sample processing, a large number of new staff were employed by the surveying agencies. In view of the number of staff involved and the variability of sample processing techniques, it was recognised that an independent quality control exercise was necessary to promote a consistently high level of reliability.

The IFE was contracted to undertake an audit of the sample sorting and identification performance of each NRA region, RPB and the DED. This report collates the results of 11 samples audited for Highland RPB. The IFE was not required to perform any statistical analyses nor interpretation of the results of the audit.

2. SAMPLE SELECTION

Nearly all samples from the 1990 River Quality Survey were sent to IFE for storage. They were catalogued on arrival and placed in crates, such that individual samples were readily accessible. A stratified random selection of samples for each sample processor was then made. Selection was undertaken by IFE staff and no selection was made before each sample had been received by IFE. Thus, sample processors had no means of knowing which of their samples would be audited.

The total number of sample processors employed nationally during the survey was considerably higher than that anticipated at the outset. As a consequence, the number of samples audited per processor was limited by the need to keep within the contracted overall total of 700 samples. A minimum of 4 samples was audited per processor, except where individuals processed very few samples or did not process material from each of the 3 seasons.

Sample selection was weighted towards spring samples in order to give early feedback on the blindspots of particular sorters and problems of identification.

3. SAMPLE PROCESSING

Biologists processing samples for the 1990 Survey were instructed to sort their samples, ideally within the laboratory, and select examples of each scoring taxon within the BMWP system. In most cases, the invertebrates were placed in a vial of preservative (4% formaldehyde solution or 70% industrial alcohol) and the BMWP taxa were listed on a data sheet. The vial of animals and the sorted material were then returned to the sample container and preservative added. Thus, each sample available to IFE for selection for audit should have included:

i) a list of the BMWP FAMILIES FOUND IN THE SAMPLE
ii) a vial containing representatives from each family
iii) the preserved sample

When these three elements were present, the sequence of operations at IFE was as follows:

a) The remainder of the sample was sorted and the BMWP families listed
b) The families contained within the vial were identified and listed
c) A comparison was made between the RPB listing of families and those identified from the vial by IFE
d) A comparison was made between the RPB listing of families and those found in the sample by IFE
e) "Losses" or "gains" from the RPB listing of families were noted. In the case of "gains", each additional family was identified, where possible, to species level, in order to clarify any specific repetitive errors.

For a number of different reasons, some samples did not include a vial containing representative examples of the families listed on the RPB data sheet. These samples were avoided for audit, where possible. When selection of such samples was unavoidable (eg where a particular sorter would otherwise have been excluded from the audit exercise), only operations a), d) and e) above were appropriate.

Several directives were issued to IFE relating to the treatment of BMWP taxa. Terrestrial representatives of BMWP scoring families, animals deemed to have been dead at the time of sampling, cast insect skins, pupal exuviae, empty mollusc shells and tail ends of "living" specimens were to be excluded from the listing of families present. Trichopteran pupae, although not routinely identified by many biologists, were to be included in the listing of families.

4. REPORTING

The results of each sample audit were recorded on a standard report form (Table 1). For audit samples where a vial of animals was included, the comparison between the RPB listing and the taxa found in the vial by IFE was shown in box A of the report form. Discrepancies could be due to carelessness, misidentifications or errors in completing the RPB data sheet. Families not on the RPB listing but found by IFE in the remainder of the sample were entered in box B of the report form under "additional families". When the families listed as "losses" in section A of the report form were compared with the full list of families recorded in the sample by IFE, some apparent losses from the vial were offset by the presence of those families in the remainder of the sample. These taxa were therefore listed in the "losses" box of section A and the "gains" box of section B and were neither a net loss nor a net gain. In these cases, the families were marked with an asterisk in both boxes. Such errors are noted as "omissions" in the table which summarises the results for each season (Table 2).

Species identifications, state of development (eg adult or larval coleopterans) and the presence of a single representative of a family within the remainder of the sample were recorded in the notes section of the report form. Where the RPB data sheet indicated that a family was noted and released at the site, this was recorded in the notes section but not included as a "loss", even though the family was not found in the vial.

For those samples which did not contain a vial of animals, box A of the report form was not applicable (N/a). Families not on the RPB list but present in the sample were listed in box B under "additional families" as before. Families recorded on the RPB list but not found by IFE were indicated on the left hand side of box B. If the vial of animals was retained by the RPB, entries in this box could include the sole representative of a family which was removed by the RPB, a family seen at the site which escaped or was released (without mention being made on the RPB data sheet), inaccurate identification, the wrong family box being ticked on the RPB data sheet or the family being present in the sample but missed by IFE.

Results of the audits of individual samples are presented in Table 3.

ACKNOWLEDGEMENTS

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TABLE 1. The IFE Report form

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION | RIVER

SEASON | SITE

SORTER | SAMPLE CODE

AQC OF BMWP FAMILIES A. IN VIAL ☐ B. IN SAMPLE ☐

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE

NET LOSSES ☐ NET GAINS ☐

NOTES

TABLE 2. The 11 samples audited for Highland RPB, with sample sorter initials and numbers of taxa 'lost', 'gained' and 'omitted'

River	Site	Sorter	Losses	Gains	Omissions
SPRING					
Strontian	Anaheilt	EG	1	5	0
Spean	Corriechoille	EG	1	5	0
Morriston	Torgyle Bridge	EG	0	1	0
Halladale	Millburn	JH	1	5	0
Little Gruinard	Road Bridge	JH	1	2	0
A'ghairbhe	Weir	JH	1	3	0
SUMMER					
Dundonnel	Dundonnel	EG	0	9	0
Halladale	Forsinain	JH	0	3	0
Farrar	Culligran	CB	0	3	0
AUTUMN					
Findhorn	Coignafearn	JH	0	1	0
Peffery	Foderty	EG	1	3	0

TABLE 3

Results of individual sample audits

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION: Highland RPB

RIVER: Strontian

SEASON: Spring

SITE: Anaheilt

SORTER: EG

SAMPLE CODE: NRA12 0960

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE 1 Sericostomatidae	ADDITIONAL FAMILIES FOUND BY IFE 2 Limnephilidae

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 3 Caenidae 4 Chloroperlidae 5 Elmidae 6 Lepidostomatidae

NET LOSSES: 1 NET GAINS: 5

NOTES

2 Anabolia nervosa
3 Caenis rivulorum
4 Chloroperla torrentium 1 only
5 Esolus parallelepipedus (larva) 1 only
6 Lepidostoma hirtum 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Spean
SEASON	Spring	SITE	Corriechoille
SORTER	EG	SAMPLE CODE	NRA12 0968

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE 1 Curculionidae	ADDITIONAL FAMILIES FOUND BY IFE 2 Helodidae 3 Chironomidae

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 4 Caenidae 5 Perlodidae 6 Limnephilidae

NET LOSSES [1] NET GAINS [5]

NOTES

1 Terrestrial species
2 Larva - Hydrocyphon sp.?
4 Caenis rivulorum 1 only
5 Isoperla grammatica
6 Halesus sp. 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Morriston
SEASON	Spring	SITE	Torgyle Bridge
SORTER	EG	SAMPLE CODE	NRA12 0910

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE None	ADDITIONAL FAMILIES FOUND BY IFE None

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 1 Hydroptilidae

NET LOSSES [0] NET GAINS [1]

NOTES: 1 Hydroptila sp. 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Halladale
SEASON	Spring	SITE	Millburn
SORTER	JH	SAMPLE CODE	NRA120859

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE 1 Sericostomatidae	ADDITIONAL FAMILIES FOUND BY IFE 2 Ephemerellidae 3 Lepidostomatidae
B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 4 Perlidae 5 Hydroptilidae 6 Simuliidae

NET LOSSES [1] NET GAINS [5]

NOTES

2 Ephemerella ignita
3 Lepidostoma hirtum 1 only
4 Perla bipunctata 1 only
5 Hydroptila sp.
6 Simulium reptans group 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Little Gruinard
SEASON	Spring	SITE	Road Bridge
SORTER	JH	SAMPLE CODE	NRA12 0888

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE 1 Nemouridae	ADDITIONAL FAMILIES FOUND BY IFE None

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 2 Caenidae 3 Elmidae

NET LOSSES [1] NET GAINS [2]

NOTES

2 Caenis rivulorum
3 Limnius volckmari (larva) 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	A'ghairbhe
SEASON	Spring	SITE	Weir
SORTER	JH	SAMPLE CODE	NRA12 0891

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE 1 Sericostomatidae	ADDITIONAL FAMILIES FOUND BY IFE 2 Limnephilidae
B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 3 Leuctridae 4 Chironomidae

NET LOSSES [1] NET GAINS [3]

NOTES: 3 Leuctra hippopus

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Dundonnel
SEASON	Summer	SITE	Dundonnel
SORTER	EG	SAMPLE CODE	NRA12 0895

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE None	ADDITIONAL FAMILIES FOUND BY IFE 1 Baetidae 2 Perlodidae 3 Lepidostomatidae

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 4 Hydrophilidae 5 Rhyacophilidae 6 Hydropsychidae 7 Goeridae 8 Brachycentridae 9 Simuliidae

NET LOSSES [0] NET GAINS [9]

NOTES

1 Baetis scambus, B. muticus
2 Isoperla grammatica
3 Lepidostoma hirtum
4 Hydraena gracilis, Helophorus brevipalpis
5 Rhyacophila sp., Agapetus sp.
6 Hydropsyche siltalai 1 only
7 Silo pallipes 1 only
8 Brachycentrus subnubilus
9 Simulium cryophilum group

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Halladale
SEASON	Summer	SITE	Forsinain
SORTER	JH	SAMPLE CODE	NRA12 0861

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE None	ADDITIONAL FAMILIES FOUND BY IFE None

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 1 Lymnaeidae 2 Caenidae 3 Hydroptilidae

NET LOSSES [0] NET GAINS [3]

NOTES

1 Lymnaea sp. (juvenile) 1 only
2 Caenis rivulorum
3 Hydroptila sp.

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Farrar
SEASON	Summer	SITE	Culligran
SORTER	CB	SAMPLE CODE	NRA12 0903

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE None	ADDITIONAL FAMILIES FOUND BY IFE None

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 1 Oligochaeta 2 Caenidae 3 Hydroptilidae

NET LOSSES [0] NET GAINS [3]

NOTES

2 Caenis rivulorum 1 only
3 Hydroptila sp.

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Findhorn
SEASON	Autumn	SITE	Coignafearn
SORTER	JH	SAMPLE CODE	NRA12 0948

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE **None**	ADDITIONAL FAMILIES FOUND BY IFE **None**

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE **1 Leuctridae**

NET LOSSES [0] NET GAINS [1]

NOTES: **1 Leuctra inermis 1 only**

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Highland RPB	RIVER	Peffery
SEASON	Autumn	SITE	Foderty
SORTER	EG	SAMPLE CODE	NRA12 0937

AQC OF BMWP FAMILIES A. IN VIAL [+] B. IN SAMPLE [+]

		LOSSES	GAINS
A	VIAL Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE 1 Brachycentridae	ADDITIONAL FAMILIES FOUND BY IFE 2 Goeridae

B	SAMPLE Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE 3 Capniidae 4 Chironomidae

NET LOSSES [1] NET GAINS [3]

NOTES

2 Silo pallipes
3 Capnia bifrons 1 only
4 Tanypodinae, Tanytarsini